

ABSTRACT

A laser device which can be used as a light source for an exposure device, can be downsized, and is easy to maintain. A laser beam (LB6) emitted from a DFB (Distributed feedback) semiconductor laser, for example, and amplified by an optical fiber amplifier is passed through non-linear optical crystals (502, 503, 504) to be sequentially doubled in frequency to thereby generate an ultraviolet-region laser beam (LB5) consisting of an octuple wave. A GdYCOB, that is, $\text{Gd}_x\text{Y}_{1-x}\text{Ca}_4\text{O}(\text{BO}_3)_3$ crystal ($0 \leq x \leq 1$) is used for the non-linear optical crystal (503) for a double wave-to-quadruple wave conversion, and a KAB, that is, $\text{K}_2\text{Al}_2\text{B}_4\text{O}_7$ crystal for the non-linear optical crystal (504) for a quadruple wave-to-octuple wave conversion. The non-linear optical crystals (502-504) are all fine-tuned in phase match angle by temperature controllers (521-523) respectively.